SB761
U7R62
#1
1981 rev.

United States
Department of
Agriculture

Forest Service

Forest Pest
Management

Denver, Colorado

Tree Hazards

Recognition and Reduction in Recreation Sites

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ACKNOWLEDGMENT

Appreciation is expressed to Dr. Lee A. Paine, Forest Pathologist, retired, Pacific Southwest Forest and Range Experiment Station, Berkeley, California, for tree failure report data, and to Larry L. Simmons, Illustrator, for artwork and layout of the publication.

ABSTRACT

Defective trees are potential hazards to people and property in recreation areas. Most reported tree failures within recreation sites in the Rocky Mountain Region occur in lodgepole pine. Defective root systems account for the greatest percentage of failures. External indicators of defects are used to identify trees that may fail. Some tree species, particularly aspen, are highly susceptible to visitor damage; managers should restrict recreational development in such forest types. Old growth spruce-fir stands should also be avoided for developed sites. Systematic, annual, documented inspections of trees in recreation sites and corrective action are recommended to reduce hazards to the public.

TREE HAZARDS:
RECOGNITION
AND
REDUCTION IN RECREATION SITES

by

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Technical Report R2-1

Revised 1981

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I-81-8-81

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INTRODUCTION

Importance of tree hazard recognition and reduction.
Portions of the USDA, Forest Service Manual (FSM 2303; 2330; 6703; 6730) outline specific objectives, policies, and responsibilities in regard to (1) hazard tree evaluation in recreation sites, (2) documentation, and (3) corrective action. Basically, these regulations specify that safeguarding public health and safety and protection of natural forest resources at all Forest Service public use areas are of prime importance.

This publication is primarily for the practicing forester or technician who has responsibility for the administration, operation, and maintenance of recreation sites, particularly campgrounds, picnic grounds, and winter sports areas in the central Rocky Mountains. This information will increase awareness of tree hazards and corrective action needed to reduce tree failure accidents, thus minimizing the probability of legal action resulting from tree failure accidents involving forest visitors.

No attempt is made to discuss all indicators of defect for every tree species in the Rocky Mountain Region. That information is best presented during field training sessions by professional forest pathologists.

Definition of a tree hazard.
A tree hazard refers to any potential tree failure due to a structural defect that may result in property damage or personal injury. It is difficult to predict tree failure with certainty because of the complex interaction between tree and environment. Every tree will eventually fail; therefore, knowledge of each tree species, site characteristics, and local weather conditions is essential when evaluating tree hazards. A defective tree is hazardous only when its failure could result in damage to something of value. In recreation areas, we are concerned with structures, forest visitors, vehicles, or other property.

The responsibility of land managers regarding tree hazards.
The Federal Tort Claim Act (1946) provides that the federal government is liable in the same manner as a private party for the negligent acts or omissions of its employees. This Act waived the long-standing doctrine of sovereign immunity which stated an individual could not sue the government without the governments' consent. The present trend is to make the landowner responsible for exercising reasonable care to prevent harm to anyone who might come on his land. In determining liability, the first question decided in all cases is: Has the landowner been negligent in the use or management of his property?

The second question to be decided, assuming that a negligent act was committed, is: What duty does a landowner owe to persons who enter his lands?

By legal definition, there are three classes of visitors on a tract of land: the invitee, the licensee, and the trespasser. Of the three visitor classes, the invitee is of primary concern to public land managers because anyone visiting "land held open to the public" belongs in this category. The invitee commands the greatest legal responsibility. The land manager owes a duty of care to the invitee not to injure him by unreasonably dangerous conduct. Also, the manager must act with reasonable care to discover and correct any unreasonably dangerous conditions on the premises or warn the invitee of the danger and risk involved or close the premises.

Responsibility to ensure public safety is roughly proportionate to the degree of development in a given land area. Highly developed sites such as campgrounds, picnic grounds, and ski areas incur a greater level of responsibility than undeveloped areas.

Because all trees have some chance of failure, it is not feasible to eliminate all tree hazards in a forested recreation area. For a land manager to protect himself from liability, it is necessary to use "reasonable care" to protect visitors. In most cases, "reasonable care" implies that areas such as campgrounds have been evaluated for safety hazards by a qualified person. Therefore, the best protection against liability is a documented program of annual inspections of recreation areas. Hazards should be identified and decisions made as to appropriate action. A program of documented safety inspections on a regular basis is essential in reducing hazards.

Tree hazards in the Rocky Mountain Region.
More than 1,300 tree failures were reported within recreation sites during 1965-80 by the USDA, Forest Service within the five state Rocky Mountain Region, which includes Colorado, Kansas, Nebraska, South Dakota, and Wyoming (east of the Continental Divide) (Table 1, page 4). The actual number of tree failures is probably much higher since this figure only includes reported failures.

Although most of these tree failures resulted in little or no damage (Table 2, page 4), there is always the possibility that an accident will occur. In fact, one incident resulted in two fatalities. Since 1965 there have been at least two incidents of injury to recreationists and 48 reports of property loss within this Region.

An accident requires both a tree failure and a target. The target may be a recreational structure, a vehicle (causing monetary loss), or a forest visitor (resulting in personal injury). With the increasing popularity of outdoor recreation and corresponding greater number of visits to developed recreation sites, the probability of a failing tree striking a target also increases.

In the outdoor-oriented Rocky Mountain area, tree hazard recognition and corrective action merits attention by all land managers.

Generally, the amount of money lost in tort claims far exceeds the cost to perform tree hazard inspection and maintenance. A court in Wyoming awarded over $43,000 for the death of a man in a National Park Service campground. He was struck by a tree with obvious physical defects that failed in the absence of unusual weather conditions (Menefee, 1973). With damage awards increasing each year, the relative cost of tree hazard evaluations is minimal.

TABLE 1. Number of reported tree failures in recreational areas listed by state and species, USDA Forest Service 1965-1980.

State	All Softwoods No.	Lodgepole Pine No. (%)	All Hardwoods No.	Aspen No. (%)	State Totals No.
Colorado	961	816 84.9	99	94 94.9	1,060
Wyoming	181	151 83.4	48	46 95.8	229
South Dakota	11	0 0	0	0 0	11
Nebraska	0	0 0	4	0 0	4
Kansas	0	0 0	2	0 0	2
Regional Total	1,153	967 83.9	153	140 91.5	1,306

TABLE 2. Number of reported tree failures for all species in recreational areas resulting in accidents listed by state, USDA Forest Service 1965-1980.

State	Accident Failures	Non-accident Failures	Total Failures
Colorado	28	1,032	1,060
Wyoming	17	212	229
South Dakota	0	11	11
Nebraska	0	4	4
Kansas	0	2	2
Regional Total	45 (3.4%)	1,261 (96.6%)	1,306

RECOGNITION OF TREE HAZARDS

Common tree defects that may indicate potential hazard. Hazardous trees may be classified into general categories by symptoms. Each category exhibits unique symptoms and each has a given probability for failure. These categories are by no means discrete; a tree may exhibit several types of defects, consequently the probability of failure increases. The following categories are listed roughly in order of importance.

Dead Trees—Snags are the most dangerous type of tree hazard. Once a tree dies, decay organisms begin weakening tree structure. Deterioration occurs most rapidly in the butt portion and root system where moist conditions favor decay. Structural weakening increases with time making older snags a hazard; however, weathered snags may also add visual quality to a recreation site as well as provide valuable wildlife habitat. A dead tree is a hazard when it threatens a forest visitor with personal injury or would cause damage to personal property or structures if it failed (Figure 1).

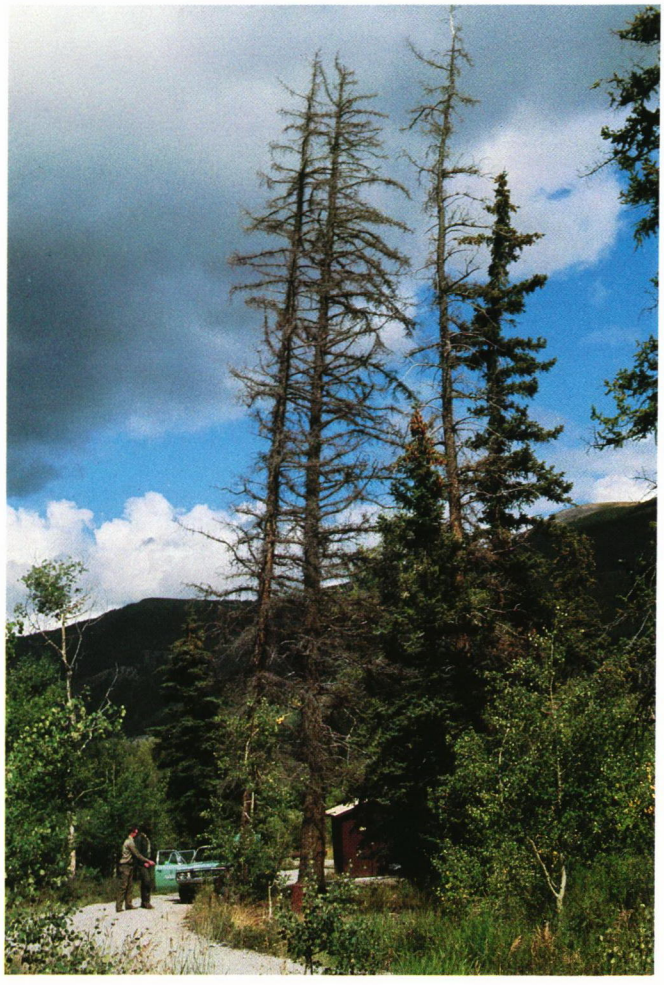

Figure 1 Standing, dead Engelmann spruce threaten visitors in the vicinity of this toilet facility. These trees should be removed.

Leaning Trees—These trees are a threat only when the lean is the result of structural damage. Trees that lean naturally usually are reinforced by compensatory growth. The greater the lean of damaged trees, the greater the probability of failure during wind gusts or snow loads. In some cases, leaning trees may have aesthetic value; however, if visitor safety is threatened or recreational structures may be damaged, corrective action must be taken (Figure 2).

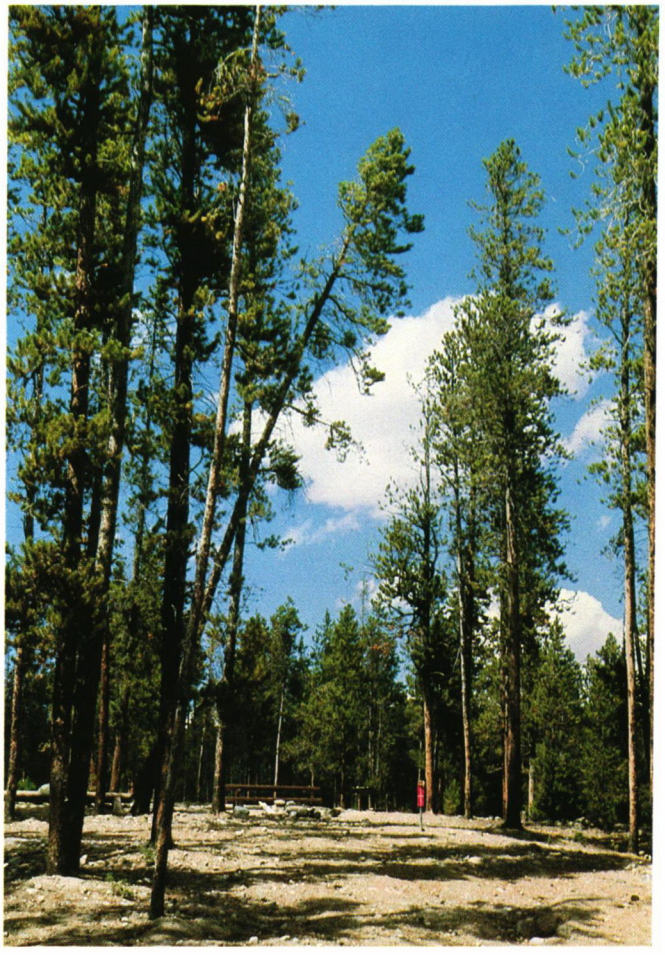

Figure 2 Leaning lodgepole pine within a family unit campsite poses a threat to visitor safety. This tree should be removed.

Root Injuries—About 76 percent of softwood and 48 percent of hardwood failures in the Rocky Mountain Region occurred in the root system (Table 3). Roots function as an anchor, providing the major resistance to windthrow. Any agent causing root damage increases the chance for failure. Woodrotting fungi destroy wood fiber in the root system, greatly reducing strength and resistance to windthrow (Figure 3).

Visual indications of root injury may not be apparent; however, increment cores usually reveal the presence of root rot. Sporophores (mushrooms or conks) around the base of the tree indicate advanced decay and therefore greater potential for failure (Figure 4).

Figure 3 Aspen infected with root decay fungus, *Ganoderma applanatum,* failed. Note absence of supporting root system.

Figure 4 Aspen infected with root and butt decay fungus, *Ganoderma applanatum,* is highly susceptible to failure and should be removed.

TABLE 3. Location and frequency of reported tree failures in recreational areas listed for softwoods and hardwoods, USDA Forest Service 1965-1980.

Location of Failure	Softwood (%)	Hardwood (%)	Total (%)
Limb	5.3	10.4	5.7
Upper Bole	7.4	17.0	8.4
Lower Bole	5.9	13.1	7.0
Butt	5.6	11.1	6.3
Root	75.8	48.4	72.6
Total	100	100	100

Physical injury to roots can weaken tree structure and provide avenues of entry for root-rotting fungi. Construction activities and vehicular and pedestrian traffic are often responsible for direct injury to roots (Figure 5). The root system may be injured indirectly through soil compaction and fluctuating water tables.

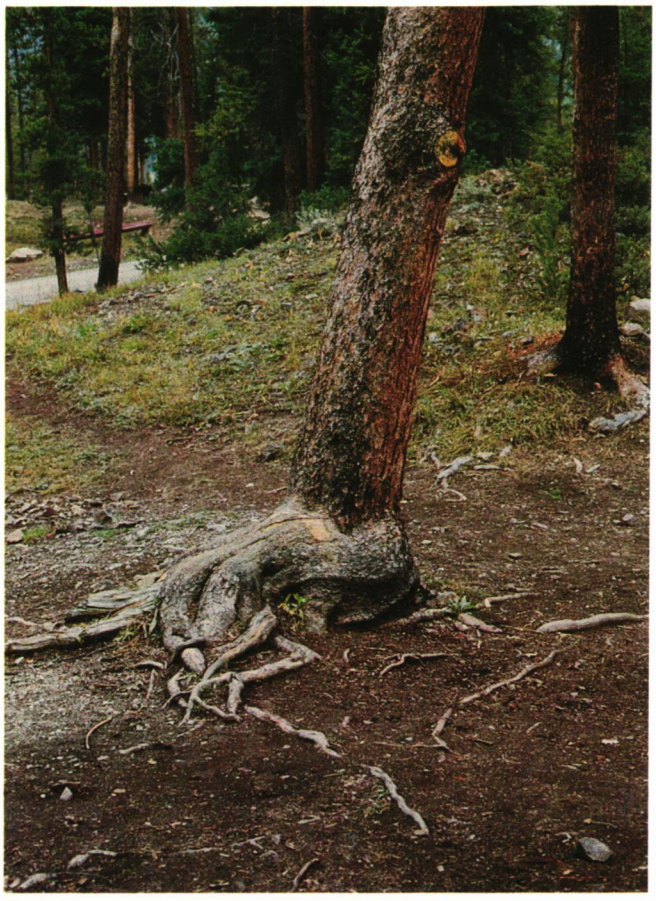

Figure 5 Lodgepole pine along a well-used trail shows effects of pedestrian traffic on root system.

Trunk Injuries—Approximately 13 percent of softwood and 30 percent of hardwood failures occurred in the trunk (Table 3). The trunk must support the weight of the entire crown and any structural injury increases the chance for failure. Trunk wounds provide entry for wood-rotting fungi that reduce the volume of sound wood and increase the probability of stem breakage. Forked trunks are structurally weaker than single stems. Burls, cankers, and scars do not affect stem strength unless complicated by rots (Figure 6). The thickness of sound wood in the outer shell determines structural strength in trees with rot defect. The minimum standards for safety based on bole diameter are presented in Figure 7. Rots must be considered together with other defects. For example, a leaning tree can tolerate less rot defect than an upright tree. Root rots are, of course, the most critical and increment cores should be taken in the basal portion of suspect trees (Figure 8, page 8).

Figure 6 Aspen that has failed at *Ceratocystis fimbriata* canker.

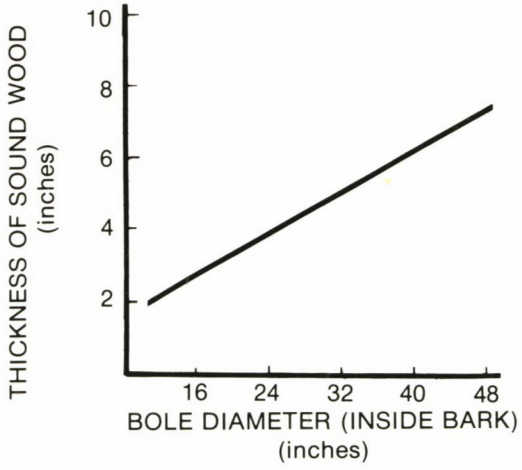

Figure 7— Thickness of sound wood in outer shell required to maintain 66% of original strength in trees with heart rot (modified from Wagener, 1963). If the amount of sound wood exceeds that established by the line on the graph, the tree can be considered relatively safe from failure.

Figure 8 Damaged Engelmann spruce root is checked for decay with an increment borer.

Crown Defects—Only a small percentage (5.7%) of tree failures occurred in the tree crown (Table 3, page 6). Because of the smaller dimensions of crown components, damage potential is lower than for other parts of the tree. Cottonwood, on the other hand, has a wide spreading crown and large branches. The major hazard of these species, therefore, resides in the upper portion of the tree (Figure 9).

Figure 9 Cottonwood with a defective crown. The defective and dead limbs should be removed to reduce the hazard to the public.

Falling branches can cause serious injuries. Spike-topped trees are not dangerous unless they are rotten. During periods of severe wind stress forked tops may fail. Witches' brooms, such as those caused by dwarf mistletoe or rust fungi, are not dangerous unless the brooms are very large or dead.

Insect Activity—In general, the presence of insect activity such as bark beetles may indicate the tree has been weakened by other agents including root diseases. Carpenter ants and wood boring insects may be indicative of butt rot (Figure 10). Therefore, all insect infested trees should be carefully evaluated.

Figure 10 Subalpine fir exhibiting basal wounds and carpenter ant activity. Note sawdust at the base of the tree.

Hazards of major forest types.
Each forest type possesses unique characteristics and each component tree species has its respective defects. The major forest types in the Rocky Mountains are presented in terms of their specific hazards.

Pinyon-Juniper Type-There have been few reported failures in this forest type. This may be due, in part, because few recreation sites are located in pinyon-juniper. In addition, the hazard is less because of the low physical stature of these trees. Juniper is relatively resistant to wood

rots and has few other serious defects. Pinyon, however, is affected by rots and other diseases and should be inspected carefully. Because of the arid environment of these stands, tree cover is at a premium; desirable cover should be retained consistent with safety standards.

Mixed-Conifer Type—Lodgepole pine and aspen account for the majority of the tree failures in the Rocky Mountain Region (Table 1, page 4). Because of the inherent differences in these tree species, they are discussed separately.

Pines—Areas with predominant pine cover are commonly used for campgrounds and picnic areas. From the standpoint of potential tree hazards, the major difference between lodgepole pine and ponderosa pine is that lodgepole pine has very thin bark which is easily damaged resulting in increased susceptibility to decay. Dwarf mistletoe is the major disease of pines in the Rocky Mountains. Large witches'-brooms should be removed to eliminate this hazard and improve tree vigor. Wood-rotting fungi are common in pines. Indicators of rot include basal fire scars, unusual swellings, swollen or punky knots, and sporophores (Figure 11). However, because of the dry climate in this Region, most wood-rotting fungi rarely form easily-visible sporophores. Burls and cankers commonly occur on pines, but do not constitute a hazard unless they are so extensive as to weaken stem structure or are complicated by rot. Increment cores should be taken to determine the amount of sound wood in trees exhibiting signs of decay.

Figure 11 Conks of the decay fungus *Phellinus (Fomes) pini* on this Engelmann spruce indicate extensive decay.

Aspen—Aspen stands usually contain many defective trees. Sporophores (Figure 12) usually indicate decay that

Figure 12 Conks (arrows) of the decay fungus *Phellinus tremulae (= Fomes igniarius)* on this aspen indicate extensive decay.

extends 5-6 feet above and below the conk. Aspen, because of their fragile bark, are especially susceptible to trunk injuries. Trees in developed recreation sites are often injured by visitors; such injuries often lead to infection by canker producing fungi (Figures 13, 14, page 10). Cankers do not weaken trees structurally unless they are large or are infected by decay fungi. Increment cores may be necessary to define the amount of defect. However, cores should be taken only when necessary, as they produce wounds which may provide infection sites for canker and decay fungi. Also, cores taken from trees with internal decay provide new points from which existing decay can move into unaffected tissues formed since the decay process was initiated in the tree.

Figure 13 Aspen mortality in the vicinity of a family unit campsite. Development of recreation sites in aspen is discouraged due to the susceptibility of aspen to injury.

Figure 14 Wounds inflicted by recreationists are often infected by canker causing fungi.

Spruce-Fir Type—A significant number of tree failures are reported in this forest type. Rot commonly occurs in overmature spruce and true fir. Subalpine fir is particularly susceptible to decay fungi and the frequency and extent of rot increases markedly with age. Trunk wounds (Figure 15),

Figure 15 Large basal wounds are often infected by decay fungi.

punky knots, frost cracks, and broken tops often indicate decay in spruce and fir; whereas, burls and cankers do not. Sporophores, when present, indicate advanced decay (Figure 16). When a defect is suspected, increment cores

Figure 16 Conk of the decay fungus, *Echinodontium tinctorium*, on this white fir indicates extensive decay.

should be taken to confirm the presence of rot. Spruce and fir usually are not windfirm because of shallow root systems. Therefore any damage to the roots will increase the probability of windthrow. Rust brooms, unless large, are not a serious hazard. Both spruce and true fir are relatively tolerant of trunk damage, but once damage occurs they are very susceptible to decay. Establishment of developed recreation sites should be discouraged in old growth spruce-fir stands because of increased occurrence and severity of decay with age.

Riparian recreation sites.
Forested sites along water courses and lakes are favorite recreation sites. Blue spruce and cottonwood are the most common species in this setting. The main defect of cottonwood is large dead or rotten branches (Figure 17).

Figure 17 Failure of this cottonwood resulted in extensive property loss and personal injury to this recreationist.

Large trees are sometimes rotten and the amount of sound wood should be measured on increment cores. Slime flux (foul-smelling and unsightly bleeding from wounds) and wetwood should not be confused with woodrotting fungi (Figure 18). These indicators are common in hardwoods and usually do not indicate decay. Many river bottom trees are not windfirm because of the high water table and coarse soil structure.

Figure 18 Open wounds and unhealed branch stubs (arrows) indicate extensive decay in these cottonwood.

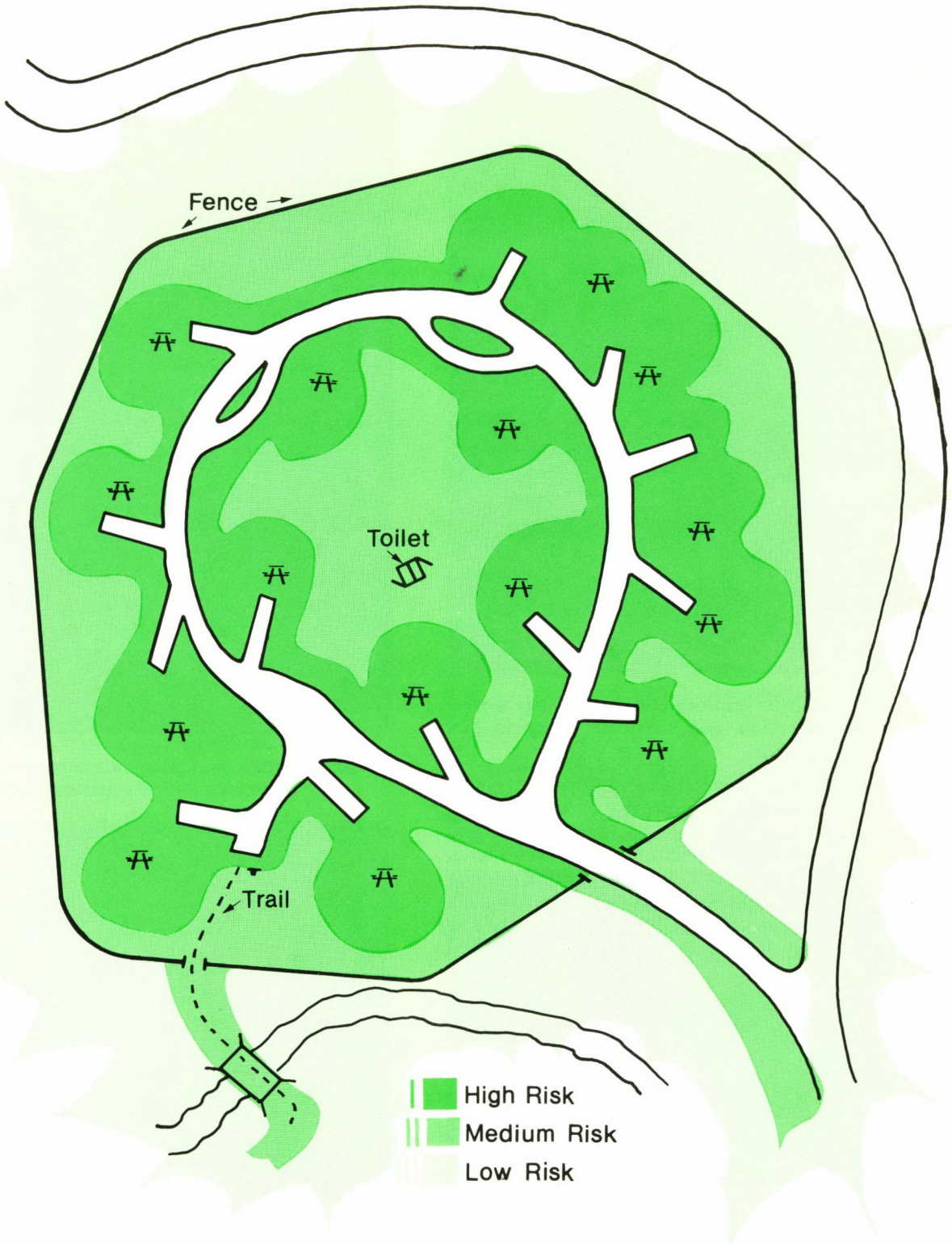

Figure 19— Recreation areas should be divided into hazard risk zones which determine the intensity of evaluation.

TREE HAZARD EVALUATION

Tree hazard evaluation is best accomplished in three steps; identification, documentation, and corrective action.

Identification

Recreation sites should be stratified into tree hazard risk zones before beginning a tree inspection (Figure 19). Plan your route through the area to include evaluation of all trees within areas of intensive public use. Trees 8 inches or greater in diameter at breast height should be carefully evaluated since 62 percent of reported failures occurred in these sizes of trees.

Tree Hazard Risk Zones (zone width varies with tree height).

I High Risk — High use areas with concentrations of people, parked vehicles and permanent structures. Highest priority for regular inspections.

II Medium Risk — Intermittent use by people and moving vehicles. Priority for inspections based on amount and type of use.

III Low Risk — No vehicles or structures and low visitor use. Regular inspections have low priority.

Inspection intensity should vary directly with the risk level. All trees within falling distance of targets (structures, vehicles, or recreationists) should be inspected. The height of hazardous trees projected to the ground determines the width of the hazard zone. Inspections should be concentrated in High Risk Zones (I) because people and most structures are concentrated in these areas. This zone includes areas around designated camp or picnic units and along major roads and trails. Medium Risk Zones (II) should be inspected commensurate with amount and type of use. Low Risk Zones (III) have a reduced potential for damage and therefore regular inspections have low priority.

Trees must be evaluated individually. Due to differences in site, micro-climate, developmental history, and inherent genetic characteristics, trees vary in hazard potential. Defects must be considered in relation to external factors such as prevailing winds, snow loads, location with respect to other trees, relative vigor, and distance and direction from a target.

Recreation site managers should be cognizant of the need to manage all vegetation in developed sites. Proper management will extend the useful life of such sites and perhaps avoid costly renovation.

The purpose of a hazard tree evaluation is NOT to remove every tree that exhibits defects; rather, the goal is to preserve the greatest number of trees in recreation areas consistent with safety requirements. Removal of too many trees in an area can destroy the aesthetic qualities for which the site was selected. Also, stand stability may be affected and the probability of wind-throw increased.

Tree inspection should be systematic. Tools necessary for this activity include binoculars, hand axe, hand saw, increment borer, diameter tape, compass, 50-foot retractable loggers tape, camera, and Tree Hazard Evaluation Forms R2-2300-11a (Appendix). When inspecting a tree begin at the base of the tree and work upwards toward the crown noting all defects. Examine all sides of the tree for hazard indicators and take increment cores of suspect trees. Look carefully at the tree base and exposed roots. After noting any structural defects, step back and consider aspects of the environment that may influence the hazard and note the proximity to any targets. In completing the Tree Hazard Evaluation form, assign a risk rating to each tree (high, medium, or low) and decide on the type and priority of corrective action. For high risk trees, remove the tree, the defective portion, or the target, or note on form why no action is to be taken; for medium risk trees monitor the tree for another year or remove the tree or the target; for low risk trees, monitor, do not remove. Trees of high risk would include those with substantial rot defect due to basal wounds and root rot as indicated by fruiting bodies. Weigh the benefits that a tree is providing against the hazard that it poses, then ask yourself; are the benefits worth the risk?

Documentation

It is extremely important to document hazardous trees. In order to reduce liability, a record is required. Documentation insures that the land manager has systematically inspected the area for hazards. Heavily-used areas should be inspected annually prior to the recreation season. Summer and fall use areas should be inspected in the spring; whereas, winter use areas should be inspected in the fall. Additional inspections are warranted any time following severe storm activity. In fact, for more than 87% of reported failures, wind was listed as a contributing factor.

The Tree Hazard Evaluation Form is designed to aid the evaluator in several ways: (1) to aid in deciding the risk rating of each tree; (2) to ensure all basic hazard information is gathered; (3) to provide program continuity despite personnel changes; and (4) to provide a permanent record and case history for all evaluated sites.

The hazard rating of a tree is determined by three major factors (tree species, potential targets, and defects present). These factors are listed on the Tree Hazard Evaluation Form and are further subdivided into risk values based on past experience and research data provided by Dr. Lee A. Paine (Forest Pathologist, retired, Pacific Southwest Forest and Range Experiment Station). When rating a tree an evaluator checks all situations which are applicable to the factor being considered (i.e., (A) species, (B) target, or (C) defect). After all factors have been considered, the evaluator adds the risk values under each separate factor (total not to exceed 3) and multiplies the sums together, the product being the overall risk rating. In the example on the Tree Hazard Evaluation Form (Appendix) tree 1 is a 12 inch d.b.h. ponderosa pine (Risk Value = 2) near Unit # 10 and parking pad (Risk Value = 3) with butt rot (Risk Value = 3). The risk rating of this tree is Medium (2×3×3 = 18); however, the amount of sound wood observed on the increment borings is sufficient to keep the tree for now (Figure 7), so

the action is to observe the tree until the next intensive inspection (3-5 years). At the next inspection the current form will be used to identify those trees which need special attention. A new form will be completed at that time and will replace the old form in the files.

The back of the Tree Hazard Evaluation Form is designed for the evaluator to map all trees evaluated. This will provide a permanent record of tree location for successive visits to the site.

Corrective Action

Corrective action is the final step in the evaluation process. It is also the most expensive and time-consuming but greatly reduces the probability of serious damage, costly cleanup action, or tort claims.

Action should be taken as soon as possible after an evaluation. In some situations hazard reduction can often be accomplished by means other than tree removal. For example, pruning dangerous limbs or stimulating tree vigor may alleviate the hazard.

High-value scenic trees can be reinforced or the defective portion removed. In some instances the target, if portable, (i.e. picnic table) can be moved to a safe distance. Marginally hazardous trees should be recorded on the form, observed over a period of time, and if the risk of failure increases, corrective action should be taken. Closing the recreation site should be considered as a viable option. If corrective action needs to be taken when sites are occupied, the situation should be explained to the public.

TREE HAZARDS IN WINTER SPORTS AREAS

Ski areas provide unique problems in hazardous tree management. Considerable alteration of stand composition occurs when ski areas are developed. Formerly protected trees become exposed when stands are opened by construction of ski trails and lift lines. Exposure often leads to greater tree failure due to windfall than occurred before the site was disturbed (Figure 20). The seasonal peak of visitor use in winter sports areas often corresponds to the time of year when many tree failures naturally occur.

Trees adjacent to permanent structures, such as buildings, ski lifts, and along ski trails should be inspected annually for possible hazards prior to the use season. Procedures for examination are the same as those described for other recreation areas. Of special importance in ski areas are trees leaning over structures such as lifts.

Trees with high risk ratings should be removed. Again, the goal of hazard analysis should be to locate and evaluate potential tree hazards and yet retain desirable tree cover consistent with safety requirements.

Figure 20 Windthrow of lodgepole pine along a chair lift at a ski area.

APPENDIX

GLOSSARY

Burl	A localized swelling on a branch or stem
Canker	A local necrotic lesion on the bark
Conk	A sporophore of a wood decay fungus
Fungus	A nongreen plant with a vegetative body composed of hyphae that reproduces by spores
Gall	A swelling or growth induced by a disease agent
Hyphae	Strands of fungus growth
Punky knots	Branch stubs infected by decay fungi
Slime flux	Bleeding on trees, usually hardwoods, caused by bacterial infections
Spike-top	A tree with a dead top
Spore	The reproductive unit of fungi—may be one or more cells
Sporophores	Fungus fruit bodies composed of hyphae and producing spores
Witches' broom	The result of dense, prolific branching on a branch or stem, usually associated with a disease organism.

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TREE HAZARD EVALUATION

FOREST: San Juan DISTRICT: Dolores SITE NAME: Yellow Pine C.G.

DATE OF INSPECTION: 7/14/81 EVALUATED BY: D. Johnson, R. Fuller

REVIEW AND COMMENTS BY: _____
(District Ranger)

			RISK VALUE																	
1/		UNIT NO.		10																
		MAP NO.		1																
		TREE NO.		1																
		D.B.H. (MINIMUM 7")		12																
TREE SPECIES	'A'	Pinyon, junipers, scrub oak	1																	
		ponderosa pine, 5-needle pines, Douglas-fir	2	2																
		Spruce/fir, aspen, cottonwood, lodgepole pine	3																	
POTENTIAL TARGET(S)	'B'	trails (low use), signs, etc.	1																	
		temporary structures, trails (heavy use)	2																	
		permanent structures, parked vehicles, people	3	3																
DEFECT(S) PRESENT	2/ 'C'	no visible defect	0																	
		slime flux, small mechanical injury	1																	
		limb defects, brooms, frost cracks, lightning scars, large mechanical wounds, forked trees, bole cankers	2																	
		exposed roots, bole cankers (decayed), dead top, conks, punky knots, butt rot, basal cavity, leaner (unnatural), root rot, dead trees	3	3																
RISK RATING	3/ Ax	HIGH (21-27)																		
	Bx	MED. (10-20)		18																
	C	LOW (0-9)																		
INTERNAL INSPECTION	4/	increment borings (yr.) taken		81																
		inches sound wood		4																
		year next boring recommended		85																
RECOMMENDED ACTION		Fell																		
		Top																		
		Prune																		
		Remove Target																		
		Observe		X																
		None																		
		Other																		
		Date Corrective Action Taken																		
		COMMENTS		Enough sound wood available to retain tree.																

1/ Prepare map of hazard tree location on reverse side of form.

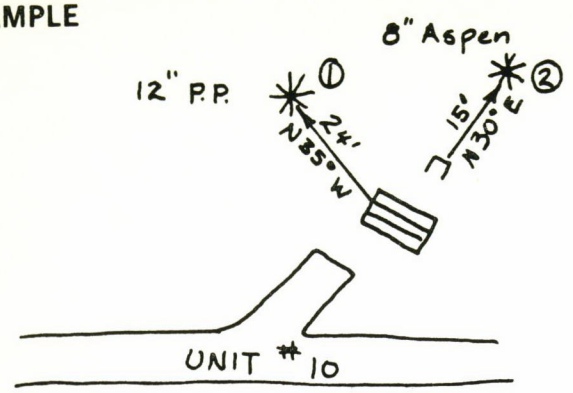
2/ Any tree with a risk value of 1 or 2 may require increment boring; a value of 3 requires increment boring.

3/ To determine Risk Rating (High, Medium, Low) for each tree evaluated, sum risk values (1, 2, & 3) under A, B, C (value not to exceed 3) and multiply sums A×B×C (i.e. Risk Rating cannot exceed 27).

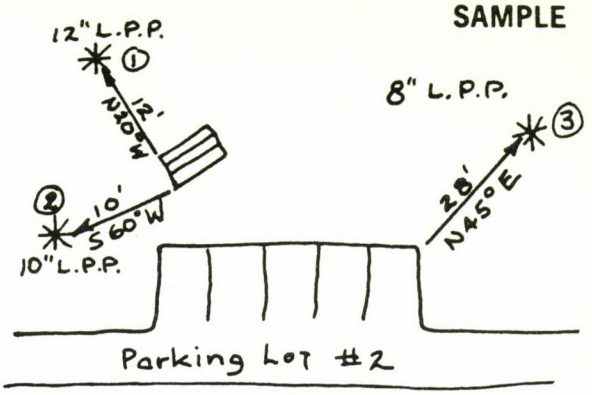
4/ Tree Hazards: Recognition and Reduction in Recreation Sites, Rocky Mtn. Tech. Rep. R2-1 (Revised 1981) See Figure 7.

HAZARD TREE LOCATION

SAMPLE



SAMPLE



1

2

3

4

5

6

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